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University of Bahrain
Department of Computer Science

College of Information Technology
ITCS332: Concepts of Programming Languages

QUIZZ#3: Chapter 16_Prolog

1) Given the list: `prophets = [ahmed, isa, [musa, hud, saleh]]`, the list head is ahmed, the list tail is [isa, [musa, hud, saleh]]

2) Name 2 kinds of Prolog statements: fact and rule

3) Prolog interpreter says No if the goal cannot be satisfied, and says Yes if the goal can be satisfied.

4) In a Prolog program, every fact or rule is terminated by .;; to get the next answer for a given query, the user types ;

5) The process of finding a complete sequence of propositions (proof) for the first subgoal before working on others is called depth first search; the process that works on all subgoals of a given goal in parallel is called breadth first search

6) There are 2 approaches of matching a given goal to a fact in a database: Forward chaining and backward chaining

7) The Prolog query: `"?- [99 | T] = [H, u, 1, k, 3.2]."` produces:

8) The two sides of a Prolog rule are separated by :- symbols. The terms in a disjunction are separated by ; symbols.

9) The right side of rule is called Antecedent, and the left side is called consequent

10) The name of a file containing a prolog program is written with an extension .pl

332 H = m U.S. 2020 [Ahmed] [] no . 3 Search
Head T = [b, f] Fact rule De First depth

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Antecedence — Consequence
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QUIZZ#3: Chapter 16_Prolog

12) In a Prolog program, every fact or rule is terminated by ;; to get the next answer for a given query, the user types ;.

13) The process that works on all subgoals of a given goal in parallel is called Breadth-First Search.

14) There are 2 approaches of matching a given goal to a fact in a database:

Forward chaining and backward chaining

15) Give an example of Headed Horn clause: like(Ahmed, apple)

16) For the query: $[isa | U] = [R, musa, h]$. Prolog produces: R = isa U = [musa, h]

17) The two sides of a Prolog rule are separated by :- symbols.

18) The terms in a disjunction are separated by ; symbols.

19) The process of assigning temporary values to variables to allow unification to succeed is called instantiation.

20) A Prolog statement consists of terms which may be: constant or variable.

21) Given the list: Prophets = $[isa, [musa, hud, saleh]]$, the list head is isa, the list tail is [musa, hud, saleh].

22) The 2 opposite approaches of matching a given goal to a fact in a database are:

forward chaining and backward chaining

like (Ahmed, apple)

Headings

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QUIZZ#3: Chapter 16_Prolog

- 1) The process of assigning temporary values to variables to allow unification to succeed is called instantiation. In Prolog to store the sum of 5 and 10 in a variable U, we write U is 5 + 10.
- 2) The right side of the Prolog headed Horn clause statement is called antecedent; the left side of the Prolog headed Horn clause statement is called consequent.
- 3) The 2 forms of Horn clausal forms are: headed and headless.
- 4) In a clausal form, the right side contains only disjunction operations and the left side contains only conjunction operations.
- 5) Prolog programs consist of statements constructed from simple terms. In Prolog, the terms are of 3 kinds: constants, variable, and structure.
- 6) Prolog has a built-in structure named trace that displays the instantiations of values of vars at each step during the attempt to satisfy a given goal. After instantiating a variable with a value, if matching fails, Prolog needs to backtrack and instantiate with a new different value for that variable.
- 7) The process of finding useful values for variables in propositions that allows matching process to succeed is called unification. In Prolog, a variable that has not been assigned a value is called uninstantiated variable.
- 8) The Prolog query: $?- f([a, b], c, [d, f], h) = f(R, G).$ Produces $R = [a, b], G = [c, [d, f], h]$
- 9) The Prolog query: $?- f(A, A, b) = f(b, A, A).$ Produces $A = b$
- 10) The Prolog query: $?- f(A, A, b) = f(b, A, A).$ Produces do not unify
- 11) The Prolog query: $?- [a | Y] = [Z, b, c].$ Produces $Y = [b/c]$

✓ in $Z = a$

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Student id: 20036424 sect #: 1 serial #:

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QUIZZ#3: Chapter 16 Prolog

- 1) The ONLY 2 operators allowed in a clausal form are: AND and OR.
- 2) Name 2 kinds of Prolog statements: variable facts and Rule.
- 3) The process of finding a complete sequence of propositions (proof) for the first subgoal before Query working on others is called Depth-first search.
- 4) Give an example of Headless Horn clause: like (Ahmed, apple).
- 5) A Prolog statement consists of terms which may be: constant or variables.
- 6) In Prolog, terms in a conjunction are separated by ,.
- 7) The Prolog query: "?- [35|T]=[H,a,1,b,7.5]." produces:
H=35 T=[a,1,b,7.5]
- 8) Given the list: Salad = [[celery,apples],walnuts,grapes], the list head is [celery,apples], the list tail is [walnuts,grapes].
- 9) The event which occurs when a goal has been satisfied is called Exit.
- 10) The event which occurs when backtrack causes an attempt to resatisfy a goal is called redo.
- 11) The process of finding useful values for variables in propositions that allows matching process to succeed is called: unification.

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QUIZZ#3: Chapter 16 Prolog

- 1) The ONLY 2 operators allowed in a clausal form are: U and R.
- 2) Name 2 kinds of Prolog statements: fact and Rule.
- 3) The process of finding a complete sequence of propositions (proof) for the first subgoal before working on others is called Depth First search.
- 4) Give an example of Headless Horn clause: ~~R~~ [E], T like (Ahmed, fish).
- 5) A Prolog statement consists of terms which may be: headed or headless.
- 6) In Prolog, terms in a conjunction are separated by ,.
- 7) The Prolog query: "?-[35|T]=[H,a,1,b,7.5]." produces:
H = 35 T = [a, 1, b, 7.5].
- 8) Given the list: Salad = [[celery, apples], walnuts, grapes], the list head is [celery, apples], the list tail is [walnuts, grapes].
- 9) The event which occurs when a goal has been satisfied is called backward chaining.
- 10) The event which occurs when backtrack causes an attempt to resatisfy a goal is called forward chaining.
- 11) The process of finding useful values for variables in propositions that allows matching process to succeed is called: Unification.

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QUIZZ#3: Chapter 16 Prolog

- 1) A Prolog statement consists of terms which may be: Fact Variables,
or rule constant
- 2) In Prolog, the terms in a disjunction are separated by ; ;
while the terms in a conjunction are separated by ,
- 3) Given the list: `prophets = [[ahmed, isa], yusuf, [musa, hud, saleh]]`, the
list head is [ahmed, isa], the list tail is [yusuf, [musa, hud, saleh]]
- 4) The process of assigning temporary values to variables to allow unification to succeed is called
instantiation.
- 5) Name 2 kinds of Prolog statements: Fact and rule.
- 6) The process of finding a complete sequence of propositions (proof) for the first subgoal before
working on others is called Depth first search; the process that works
on all subgoals of a given goal in parallel is called breadth first search
- 7) There are 2 approaches of matching a given goal to a fact in a database:
backward chaining and forward chaining
- 8) The Prolog query: `"?- [t|U]=[G,b,f]."` produces:
U=[b, f]
G=t
- 9) In Prolog, control can leave a goal through cut port or exit port.
- 10) The right side of rule is called conjunction, and the left side is
called disjunction
Antecedent
Consequent

May
Redo

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QUIZZ#3: Chapter 16_Prolog

- 1) A Prolog statement consists of terms which may be: fact, structure, variable or rule, variable, or constant
- 2) In Prolog, the terms in a disjunction are separated by ; while the terms in a conjunction are separated by ,
- 3) Given the list: `prophets = [[ahmed, isa], yusuf, [musa, hud, saleh]]`, the list head is [ahmed, isa], the list tail is [yusuf, [musa, hud, saleh]].
- 4) The process of assigning temporary values to variables to allow unification to succeed is called instantiation.
- 5) Name 2 kinds of Prolog statements: facts, rules, goals and queries.
- 6) The process of finding a complete sequence of propositions (proof) for the first subgoal before working on others is called depth first search; the process that works on all subgoals of a given goal in parallel is called breadth search.
- 7) There are 2 approaches of matching a given goal to a fact in a database: backward chaining and forward chaining.
- 8) The Prolog query: `"?- [t|U] = [G, b, f]."` produces: exit
U = [b, f] G = t
- 9) In Prolog, control can leave a goal through fail port or fail port.
- 10) The right side of rule is called Antecedent, and the left side is called consequent.

Student Name: Maitham Ahmed

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QUIZZ#3: Chapter 16_Prolog

QUESTION ONE: Write a prolog program (Predicates) to obtain a list L2 by deleting a given element X from a given list L1. $\text{del}(X, L1, L2)$.

$L1 = [2, 3, 4, 5, 6]$

$L2 = [4]$
 $= [2, 3, 5]$

$\text{del}(X, L1, L2) :-$

$\text{del}(A|B)$

QUESTION TWO: Carefully study the following prolog program and find out what will be printed by prolog for each of the following queries.

What88(X, 1, X).

What88(X, Y, Z) :- $Y > 1$, Y1 is Y-1, What88(X, Y1, Z1), Z is $X * Z1$.

?- What88(3, 4, U).

$U = 21$

yes.

?- What88(2.5, 3, M).

$M = 15.625$

yes.

?- What88(2, 2.5, N).

$N = 8$

yes.

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QUIZZ#3: Chapter 16_Prolog

* * * * *

- a) Given the following Prolog clauses (predicates):

What $2([], [])$.

What2 ([A] , [A,A]) .

```
What2([A,B|C],[B,A|D]) :- what2(C,D).
```

What will be printed by the Prolog interpreter in each of the following 3 queries?

?- what2([1,a,2,b,3,c,4,d,5,f],LG).

$$L_6 = [f, 5, 4, 4, C, 4, 6, 2, 9, 1]$$

~~Yes~~ Yes.

$$LG = [a, 1, b, 2, c, 3]$$

```
?- what2([r,t,7,5],UG).
```

(1) $G = [5, 7, 6, 8]$

$$u.e. = [t, r, s, 7]$$

~~Yes~~ Yes.

? - what2 (A,B) .

$$A = \{ \}$$
$$B \subseteq C$$

Yes.

- b) Define a Prolog predicate **interval (I,K,L)** that creates a list containing all integers within a given range. It takes two integers I and K such that $I \geq K$ and returns a list L containing all consecutive integers from I down to K.

?- interval (10,5,LC).

$$LC = [10, 9, 8, 7, 6, 5]$$

Yes

?- interval (81,76,YF) .

$$YF = [81, 80, 79, 78, 77, 76]$$

Yes

?- interval (2,9,Lst)..

NO

interval $(I, I, [I])$.

interval $(I, K, [I](1))$:-

 $I > K,$

$T1$ is $I-1$

interval (τ_1, k, L) .

The image shows a document page that has been almost entirely obscured by dense, overlapping handwritten scribbles and ink marks. The scribbles are dark and chaotic, covering most of the page area. Faint, illegible text is visible through the scribbles, particularly on the left side where the word "Inter" appears twice. On the right side, some characters like "X", "Y", "L", and "1" are visible. The overall appearance is that of a document that has been heavily tampered with or redacted.

Interval $(I, I, [I])$. 128

Interval (I, K, L) :- $I > K$, II is $I - 1$,
Interval (II, K, L).